# Phthalate Research Coming of Age? with Shanna Swan

Ernie Hood



In 2005 Shanna Swan and colleagues published groundbreaking research linking mothers' phthalate levels with altered genital development in their baby sons. In the four years since the publication of this paper, which was *EHP*'s 2009 Paper of the Year, how much more have we learned about the health effects of phthalates? In this podcast, Swan discusses the state of the science. Swan is a professor of obstetrics and gynecology and of environmental medicine at New York's University of Rochester School of Medicine and Dentistry, where she is also director of the Center for Reproductive Epidemiology.

**AHEARN**: It's *The Researcher's Perspective*. I'm Ashley Ahearn.

You'll find phthalates in soft plastics and in oily substances like perfumes and hair sprays, lubricants, and dispersants. Billions of pounds of these industrial compounds are produced every year, worldwide.[1] And given some of the kinds of products phthalates are used in—think IV tubing and cosmetics—it's easy for these compounds to make their way into the human body.

Dr. Shanna Swan was one of the first scientists to document associations between phthalates and reproductive development in humans. She's a professor at the University of Rochester School of Medicine and Dentistry and director of the Center for Reproductive Epidemiology there.

In a groundbreaking study in 2005, Dr. Swan looked at anogenital distance in boys—a measure of genital development—and correlated that with levels of phthalates in their mothers' urine.[2]

She told science writer Ernie Hood about her findings.

**SWAN**: We found that the concentration of several phthalate metabolites in urine samples taken from mothers when they were pregnant were significantly linked to a

measure of male genital development in their offspring, and that measurement is called anogenital distance, or AGD, which reflects the size of the entire genital area in the male.

**HOOD**: The paper was quite controversial at the time it was published. Why it was so controversial?

**SWAN**: Well, it was controversial because we used a measure which had almost never been used in humans before, although it's widely used in rodent studies—it's a standard in toxicology for assessing reproductive toxicity. But it was new for humans. Also, we were the first to show a link between prenatal phthalate exposure and reproductive development in humans, although that had been shown also in rodents, in fact termed the "phthalate syndrome."

**HOOD**: In August 2008, President Bush signed into law a ban on the use of six phthalates in children's products.[3] Has the legislation gone far enough at this point, or do you believe we need to further reduce the use of phthalates in consumer products?

**SWAN**: I think that legislation was important and historic in many ways. It doesn't address, however, exposure to phthalates from sources other than toys, and in particular it doesn't address exposure to phthalates by pregnant women. And since we now believe that the source of exposure to at least two of the more toxic phthalates is through food, we really don't know how to reduce that risk, and we can't buy phthalate-free food short of going to our farmers market and getting something, you know, the carrots with the tops on them. But any processed food has the potential to be contaminated by phthalates. Not to say they all are, but that needs to be examined. So I think we haven't gone far enough to understand what are the sources of most phthalates, in particular the diethylhexyl phthalate that's in PVC and that we're all most concerned about.[4] We don't really know how that's getting into our bodies.

**HOOD**: Dr. Swan, the population studies have shown that we all have a certain low level of phthalates in our bodies, but it's several different phthalates. What is the effect of that, if any? That cumulative exposure—does it add up, or are the low levels relatively safe at those extremely low levels?

**SWAN**: That's a really important question. That's probably the number one question that's confronting people working in this area today. And the evidence from rodent studies is that it does add up, that you have what some have called "the new math," where you have things that are apparently safe at very low doses, and then you get three or four of them together at those low doses, and you add up to considerable risk. That may very well be what's happening to people and why we see measurable effects in our studies when people are exposed to only low levels of each individual phthalate.

**HOOD**: Given the subsequent knowledge that has emerged since 2005, has anything changed since then in terms of your public message about phthalates?

**SWAN**: I don't think so. I think that actions can be taken which are precautionary, which I suggested at the time, and I think that's pretty much where we are now. Until we have several replications of this study, you know, I think we have to view this only as a precautionary message.

But there are things that people can do to reduce their exposure to phthalates, although we need to know more of those things, because we don't really understand sources of exposure. That's another area where the science has developed: there's been a lot more work on trying to figure out what are the sources of exposure, how could people limit their exposure if they wanted to, and I think that has been very promising as well.

**HOOD**: In your estimation, where do things stand today with regard to acceptance of your methods and your findings?

**SWAN**: Well, I think they're still controversial. I think they're much more widely accepted, and they have actually been brought into ongoing studies now, which shows some degree of acceptance. They've been used to support legislation, which shows some degree of acceptance. But undoubtedly they have to be published again by other authors. Others have to examine this. And we actually have been funded to pretty much redo that study in a larger population using improved methods. So hopefully we'll be able to bolster our own findings.

**AHEARN**: That was Dr. Shanna Swan talking with science writer Ernie Hood. Dr. Swan is a professor at the University of Rochester School of Medicine and Dentistry and director of the Center for Reproductive Epidemiology.

And that's *The Researcher's Perspective*. I'm Ashley Ahearn. Thanks for downloading!

## References and Notes

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[1] CPSC. Review of Exposure Data and Assessments for Select Dialkyl *Ortho*-Phthalates. Bethesda, MD:Consumer Product Safety Commission (2010). Available: http://tinyurl.com/2g34j94 [accessed 18 Oct 2010].

[2] Dr. Swan's article "Decrease in Anogenital Distance among Male Infants with Prenatal Phthalate Exposure" [Environ Health Perspect 113(8):1056–1061 (2005); doi:10.1289/ehp.8100] was selected as an *EHP* Paper of the Year.

[3] CPSC. Statement of Policy: Testing of Component Parts With Respect To Section 108 of the Consumer Product Safety Improvement Act. Washington, DC:Consumer Product Safety Commission (7 Aug 2009). Available: http://tinyurl.com/35uckya [accessed 18 Oct 2010].

[4] Polyvinyl chloride (PVC) is one of the most widely used plastics. PVC softened with diethylhexyl phthalate (DEHP) is used in products such as intravenous tubing and bags, flooring, car interior parts, cable insulation, inflatable products, toys, hoses, shower curtains, clothing, and upholstery. DEHP—which can leach from plasticized PVC that comes in contact with fluids, heat, or lipids—is a reproductive and developmental toxicant in animals. Evidence of human health effects is less conclusive, but a growing body of research suggesting potential harm led to the August 2008 banning of DEHP in amounts greater than 0.1% from children's toys.

**Ernie Hood** is a science writer, editor, and podcast producer in Hillsborough, North Carolina. He also produces and hosts the weekly science radio show *Radio in Vivo*.